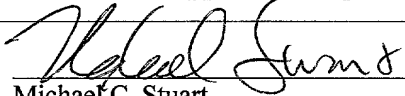


FORM PTO-1390 (REV 10-94)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		DOCKET #: 3397-93PUS	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371					
				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/720550	
INTERNATIONAL APPLICATION NO. PCT/FI99/00563		INTERNATIONAL FILING DATE 24 June 1999		PRIORITY DATE CLAIMED 25 June 1998	
TITLE OF INVENTION Method and Arrangement for Calendering Paper and Board Before and After Coating					
APPLICANT(S) FOR DO/EO/US Pauli KYTONEN; Mikko TANI					
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) 6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An UNEXECUTED oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11. to 16. Below concern other document(s) or information included:</p> <ol style="list-style-type: none"> 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input checked="" type="checkbox"/> Other items or information (<i>specify</i>): PCT Publication No. WO99/67462, Int'l Preliminary Examination Report, PCT Request, and PCT Demand 					

U.S. APPLICATION NO. 097720550 <small>(if known, see 37 CFR 1.5)</small>		INTERNATIONAL APPLICATION NO. PCT/FI99/00563		ATTORNEY'S DOCKET NUMBER 3397-93PUS	
17.[x]The following fees are submitted:					
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO \$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482)..... \$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$	860.00
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	-0-
Claims	Number Filed	Number Extra	Rate		
Total Claims	21 - 20 =	1	x \$18.00	\$	18.00
Independent Claims	2 - 3 =	0	x \$80.00	\$	-0-
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$	-0-
TOTAL OF ABOVE CALCULATIONS =				\$	878.00
Reduction of 1/2 for filing by small entity, if applicable.				\$	-0-
SUBTOTAL =				\$	878.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	-0-
TOTAL NATIONAL FEE =				\$	878.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by the appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$	-0-
TOTAL FEES ENCLOSED					\$878.00
				Amount to be refunded:	\$
				charged:	\$
a. [x] One check in the amount(s) of \$ 878.00 to cover the above fees is/are enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <u>03-2412</u> in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. [x] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>03-2412</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: <u>Michael C. Stuart</u> Cohen, Pontani, Lieberman & Pavane 551 Fifth Avenue, Suite 1210 New York, New York 10176			 <u>Michael C. Stuart</u> Registration Number: <u>35,698</u> Tel: (212) 687-2770		

528 Rec'd PCT/PTO 22 DEC 2000

By Express Mail # EL660968359US

Attorney Docket # 3397-93PUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re National Phase PCT Application of

Pauli KYTONEN et al.

International Appln. No.: PCT/FI99/00563

International Filing Date: June 24, 1999

For: Method and Arrangement for Calendering Paper
and Board Before and After CoatingPRELIMINARY AMENDMENT

Assistant Commissioner for Patents

Washington, D.C. 20231

BOX PCT

S I R:

Prior to examination of the above-identified application, amend the application as follows:

IN THE TITLE:

Change "arrangement" to "apparatus".

IN THE SPECIFICATION:

Page 1, before line 4, insert the title:

--FIELD OF THE INVENTION--.

Page 1, line 4, delete "according to the" and insert therefor --and apparatus--.

Page 1, line 5, delete "preamble of claim 1".

Page 1, delete lines 8 and 9 and insert therefor the title:

--BACKGROUND OF THE INVENTION--

Page 1, last line, change "round" to --around--.

Page 2, line 19, change "published" to --patent--; before "DE" insert --No.--.

Page 2, line 24, change "DE" to --German Patent--; after "No." insert --DE--.

Page 3, line 7, after "In" insert PCT patent publication No.--.

Page 3, line 22, after "In" insert PCT patent publication No.--.

Page 3, after line 30, insert the title:

--SUMMARY OF THE INVENTION--

Page 4, delete lines 5 to 11.

Page 4, line 15, change "fibres" to --fibers--.

Page 4, line 23, after "previously" insert --obtained--.

Page 4, delete lines 32 and 33 and insert the following title:

--DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS--

Page 5, line 21, change "fibres" to --fibers--.

Page 5, line 24, change "fibres" to --fibers--.

Page 5, line 27, change "fibres" to --fibers--.

Page 5, line 29, change "fibres" to --fibers--.

Page 6, line 3, change "fibres" to --fibers--.

Page 6, line 20, after "use" and "e.g.", insert a comma.

Page 6, line 30, after "limit" and "e.g.", insert a comma.

Page 7, line 9, after "in" insert --PCT patent publication No.--.

Page 7, line 18, after "nip", "e.g." (both occurrences) and "divided", insert a comma.

Page 8, line 17, after "but" and "e.g.", insert a comma.

Page 8, after line 27, insert the following, beginning as a new paragraph:

--Thus, while there have been shown and described and pointed out fundamental novel features of the present invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices described,

and in their operation, may be made by those skilled in the art without departing from the spirit of the present invention. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.--.

Page 9, line 1, change "Claims:" to --What is claimed is:--.

IN THE ABSTRACT:

In the title, delete "(57)".

Line 1, after "A method" insert --and apparatus--.

Line 3, change "According to the method, at" to --At--.

IN THE CLAIMS:

Cancel claims 1 to 13, without prejudice.

Add the following new claims:

14. A method for calendering paper and board when manufacturing coated grades of paper or board comprising:

calendering at least one of the surfaces of an uncoated base material web with a shoe calender having a nip length of at least 50 mm;

applying at least one layer of coating at least onto the calendered surface of the base web;
and

calendering the coated surface of the base web with a calender having a nip length of no more than 50 mm.

15. The method of claim 14, wherein the uncoated surface of the base web is calendered with a shoe calender having a nip length of 50 to 270 mm.

16. The method of claim 14, wherein the coated surface of the base web is calendered with a belt calender having a nip formed between two rolls.

17. The method of claim 14, wherein the coated surface of the base web is calendered with a belt calender having a nip formed by means of a short shoe.

18. The method of claim 14, wherein the uncoated surface of the base web is calendered with a shoe calender having a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable.

19. The method of claim 16, wherein the uncoated surface of the base web is calendered with a shoe calender having a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable.

20. The method of claim 17, wherein the uncoated surface of the base web is calendered with a shoe calender having a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable.

21. The method of claim 15, wherein pressure applied to the uncoated surface of the base web by the shoe calender is from 0 to 15 MPa.

22. The method of claim 15, wherein pressure applied to the uncoated surface of the base web by the shoe calender is from 4 to 12 MPa.

23. The method of claim 14, further comprising heating the base web such that surface fibers thereof are at at least a glass transition temperature when the base web enters the shoe calender.

24. The method of claim 21, further comprising heating the base web such that surface fibers thereof are at at least a glass transition temperature when the base web enters the shoe calender.

25. The method of claim 23, wherein the base web is heated with the aid of one of pre-wetting, pre-steaming and heating the web with a heated backing roll.

26. The method of claim 24, wherein the base web is heated with the aid of one of pre-wetting, pre-steaming and heating the web with a heated backing roll.

27. An apparatus for calendering paper and board when manufacturing coated grades of paper or board comprising:

a first calender for calendering at least one of the surfaces of an uncoated base material web, the first calender comprising a shoe calender having a nip length of at least 50 mm;

a means for applying at least one layer of coating at least onto the calendered surface of the base web; and

a second calender for calendering at least the coated surface of the base web, the second calender having a nip length of no more than 50 mm.

28. The apparatus of claim 27, wherein the shoe calender having a nip length of 50 to 270 mm.

29. The apparatus of claim 27, wherein the second calender is a belt calender having a nip formed between two rolls.

30. The apparatus of claim 27, wherein the second calender is a belt calender having a nip formed by means of a short shoe.

31. The apparatus of claim 27, wherein the shoe calender has a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable

32. The apparatus of claim 28, wherein the shoe calender has a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable


33. The apparatus of claim 29, wherein the shoe calender has a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable

34. The apparatus of claim 30, wherein the shoe calender has a shoe divided into sectors in a travel direction of the web, a compression load of the sectors being independently controllable

REMARKS

This preliminary amendment is presented to place the application in proper form for examination and to eliminate multiple dependency from the present claims. No new matter has been added. Early examination and favorable consideration of the above-identified application is earnestly solicited.

Respectfully submitted,
COHEN, PONTANI, LIEBERMAN & PAVANE

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22 December 2000

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PCT/FI99/00563

WO 99/67462

1

Method and arrangement for calendering paper and board
before and after coating.

5 The present invention concerns a method according to the
preamble of claim 1 for calendering paper and board in the
manufacture of coated grades of paper or board.

10 The invention also concerns an arrangement for implementing
the method.

15 Paper or board is calendered in order to improve its
printability properties. Calendering increases the smoothness
and glare of the surface, and in addition, it affects the
thickness and bulk (cm^3/g) of the material. Changes other than
those affecting the surface are usually unintentional,
because changes in material thickness are not desired. The
unavoidable change in bulk must be adapted to the desired
surface quality such that the desired surface quality and
bulk as well as the desired final material thickness are
20 obtained. Uncoated material can be subjected to calendering
prior to the coating step, or the calendering may be carried
out after coating, or at several steps. Many types of
calendering methods and apparatuses are available, whereof
machine calenders, softcalenders and supercalenders may be
25 mentioned, and as the most recent type of calenders, shoe
calenders and belt calenders may be cited. Each type of
calender has its individual effect on the quality of the
produced material, as well as its own typical field of
application. The different types of calenders and their use
30 are well known in the manufacture of paper and board.

35 European patent No. 0 370 185 describes a typical shoe
calender comprising a backing roll and an arched shoe-like
stop designed to encircle part of the roll surface. An
endless belt travels round the shoe and is fitted to move at

the same speed as the material being treated. The material to be calendered travels between the belt and the backing roll and is glazed against the surface of the backing roll. The backing roll can be heated and deformations of the surface occur due to the press power of the shoe and the backing roll, and due to heat. The glazing result is naturally also affected by the wetness of the web. The shoe calender provides a number of advantages, such as the fact that, due to the longer dwell time, a smaller compression load and possibly temperature may be used than in roll calenders, still achieving a similar end result. Due to the reduced nip pressure a smaller contraction of the calendered web is achieved, thus preserving a greater part of the original stiffness, or bulk, of the web.

A shoe calender usually provides better glare than the corresponding softcalender.

The German Published Application DE 43 22 876 describes a shoe calender with a smaller shoe width and thus also a shorter glazing zone than in the above-cited solution. In this calender, two calendering nips can be fitted against the same backing roll, and the strap surrounding the shoe is similar to the roll jacket. In DE publication No. 44 10 129, a shoe calender is described where the shoe is divided into two zones in the moving direction of the web being treated, the press power of the zones against the backing roll being adjustable independent of each other.

Belt calenders, in which the calender zone is provided by a roll and a belt pressed against said roll by means of a second roll, bear a close resemblance to shoe calenders. The belt may be flexible in the direction of its thickness, whereby a pressure treatment zone defined by the properties of the belt and the geometry and loading force of the

calender rolls used will be provided between the backing roll and the belt. Also a calender having a very short pressing shoe is termed a belt calender, whereby the length of the nip almost corresponds to a nip formed with two rolls.

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Long-nip calenders, belt calenders and softcalenders are well suited for calendering board. In WO 96/28609, a coated packing board is described, whose manufacturing process involves the use of a lengthened soft calender nip. The board is calendered after coating. By calendering, a sufficiently good printing surface is obtained, and due to the lengthened nip, a lower pressure may be applied during calendering, whereby a smaller reduction in density and basis weight is achieved. This is of particular advantage in the manufacture of packing board because a lighter board provides greater flexural strength. The length of the lengthened nip of the calender used is reported as being from 30 to 100 mm, preferably 60 to 70 mm. Thus, the calender used is still one having a fairly short nip. The web speed and dwell time used are not reported.

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In WO 97/44524, a method for manufacturing LWC paper is described. This publication makes clear the considerable effect of the treatment temperature on the properties of the paper being manufactured. According to the publication, coated paper is calendered in a soft calender and the temperature of the paper is kept below the softening temperature of lignin. According to the publication, the method achieves much better glare than previously known methods involving the use of a softcalender.

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The present invention aims at providing a method for manufacturing precalendered and end-calendered coated paper or board.

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The invention is based on first calendering the material to be treated in a long-nip calender, and after coating, in a calender having a short nip.

5 In more detail, the method according to the invention is characterized by what is stated in the characterizing part of claim 1.

10 The arrangement according to the invention, then, is characterized by what is stated in the characterizing part of claim 6.

The invention achieves considerable benefits.

15 Paper and board which consist of plant fibres behave in different ways during calendering when uncoated and when coated. In addition, the calendering is essentially affected by the moisture content of the material, wherefore calendering is usually accompanied by moisture control of the
20 treated material. By means of the invention, these material properties can be exploited, thereby achieving paper and especially board having better printability and strength properties than previously. As regards board and also the thickest grades of paper, a change in density during
25 calendering essentially affects the strength properties of the material in the above-described manner, wherefore it is of particular advantage to be able to control the calendering process during the different manufacturing steps in accordance with the material properties when producing these
30 materials.

The invention is explained in more detail below with the aid of the following detailed description.

35 In the following, the solution of the invention is explained

in the context of board manufacture, which is what the invention is particularly well suited for. The invention is also applicable to a similar treatment of a paper web.

5 During calendering, the demands of the process vary according to whether the web being treated is coated or whether uncoated material is being treated. This is due to the different behaviour of the fibres constituting the material (usually fibres derived from wood), and the coat, by the
10 action of the thermomechanical stress affecting them during calendering. Thus, different demands are made on the calender and the process at the different stages of the treatment of the web, and it is of advantage to use a different method of calendering at the precalendering stage than is used for the
15 final calendering after coating. Uncoated board mainly contains raw materials such as cellulose, hemicellulose and lignin, contained in wood or other fibrous raw material. These have the structure of polymers having markedly higher glass transition temperatures than the polymers contained in
20 the coating. On the other hand, the base board consists of crossing fibres which can hardly move at all in relation to each other, whereas the coating consists of binders and small particles which move relatively easily in relation to each other and on the base board when compared to fibres. Thus,
25 uncoated board requires longer treatment times and higher thermomechanical stress before permanent deformations of the fibres are achieved. The coating layer, on the other hand, moves fairly easily on the surface of the base board when compared to fibres, and thus, shorter treatment times can be
30 used when processing the surface of coated board.

In the process of the invention for manufacturing coated board or paper, the web is finished by calendering at least such that the calendering which takes place prior to the
35 coating step, i.e. the so called pre-calendering, is

performed in a long-nip calender where the web is taken to a pressing zone formed by the belt and the backing roll, the fibres forming said web being subjected to a treatment in said zone during which the pressure in the treatment zone rises to 15 MPa at the most and the temperature of the web surface part reaches at least the glass transition temperature of the cellulose fibres.

The maximum pressure in the treatment zone is kept at 0 to 15 MPa, preferably, however, at 4 to 12 MPa. The web is taken to the treatment zone at a moisture content and temperature where at least the glass transition temperature of the material forming its surface part has been reached, the web thus having good workability properties. The glass transition temperature can be reached either by taking the web to the calendering by means of a pretreatment, such as steaming and/or wetting with water, or the conditions in the calendering zone are adjusted such that the preconditions for working the web are met in the calendering zone. Here, it is possible to use e.g. the combination of prewetting and a heated backing roll.

Thus, the calendering zone is mainly characterized by being formed between the belt and the stop surface for calendering arranged opposite the belt, and in that a pressure affecting the web prevails inside the calendering zone, its intensity varying from 0 to 15 MPa. The lower limit of the pressure range is reached, for example, such that the calendering zone is formed between at least two belts stretched by belt guiding means, and a stop surface, and the upper limit e.g. by so called shoe calender technology. In addition, it is characteristic of the calendering zone that the dwell time of the web in the calendering zone is at least 3 ms, while, however, it is 40 ms at the most, which at web speeds of 400 to 1000 m/min corresponds to calendering zone lengths of 50

to 270 mm.

A web thus precalendered, then, is characterized by good surface smoothness while its flexural strength remains almost at its initial level. When the web surface is smooth and sealed prior to the coating step, the amount of coating mix applied can be essentially reduced or, correspondingly, the printability of the end product can be improved, even to a level exceeding that described in WO 96/28609 without losing the flexural strength or "bulkiness" of the web.

In the case of a long-nip calender, the dwell time in the nip (the nip time) can be optimized without changing the other process conditions. In the present context, a long-nip calender is a machine having a nip length exceeding 50 mm. "Nip length" is the length over which the treated web is subjected to a pressing influence. Nip pressure may vary over the length of the nip e.g. such that the nip is divided e.g. by dividing the pressing shoe into sectors in the travelling direction of the web, the press power of the sectors towards the backing roll being independently controllable. Such a construction also makes it possible to alter the nip length stepwise by removing the press power of the outermost sectors. Nip length is selected according to the desired calendering effect. In the solution of the present invention, an uncoated paper or board web is treated with a calender having a nip length of 50 to 270 mm. When applying a speed of 800 to 1000 m/min, common in board manufacture, a nip time of 3 to 20 ms is thus obtained.

In the case of belt calenders, on the other hand, markedly greater forces in the surface direction have been found to occur than is the case for softcalenders. Thus, they will provide an advantageous effect on quality especially in the manufacture of coated board and corresponding products,

whereby the aim during the final calendering step is to move the coating mix on the surface of the base web and to align the coating mix particles. Such alignment is achieved by means of a belt calender supported by a backing roll or by a shoe calender having a very short shoe. The length of the shoe should not exceed 50 mm.

The result of the calendering can also be affected by the material of the backing roll, in other words, by using a soft or a hard backing roll. The material of the backing roll is selected in accordance with the type of nip, the belt material, and the requirements set by the manufactured product. The invention can be applied to both on-line and off-line machines.

Usually, board and paper are coated in the same fashion on both sides, but e.g. when manufacturing packing board, it may be necessary to coat only one side of the web or to prepare a different coat for each side of the web. In such a case it is possible to perform the calendering differently for the different sides of the web. Usually, heated rolls are used in calendering in order to produce a thermomechanical impact, but in some cases even cold rolls may be used at least for treating one of the sides of the web. An advantage provided by shoe calenders is that the web may be taken to the calender in a considerably wet state. This is beneficial particularly in on-line machines.

Claims:

1. A method for calendering paper and board when manufacturing coated grades of paper or board, comprising

- calendering at least one of the surfaces of an uncoated base material web,

- applying at least one layer of coating at least onto the calendered surface of the base web, and

- calendering at least the coated surface of the base web,

characterized by

- calendering the uncoated surface of the base web by means of a shoe calender having a nip length of at least 50 mm, and

- calendering the coated surface of the base web by means of a calender having a nip length of 50 mm at the most.

2. The method of claim 1, **characterized** by calendering the uncoated surface of the base web by means of a shoe calender having a nip length of 50 to 270 mm.

3. The method of claim 1, **characterized** by calendering the coated surface of the base web by means of a belt calender whose nip is formed between two rolls.

4. The method of claim 1, **characterized** by calendering the coated surface of the base web by means of a belt calender whose nip is formed by means of a short shoe.

5. The method of any one of the previous claims,
characterized by calendering the uncoated surface of the base
web by means of a shoe calender whose shoe is divided into
sectors in the travelling direction of the web, the
5 compression load of the sectors being independently
controllable.

6. The method of claim 2, **characterized** in that the maximum
pressure in the treatment zone is 0 to 15 MPa, preferably 4
10 to 12 MPa.

7. The method of claim 1 or 6, **characterized** by taking the
web to the first calender in a state in which the glass
transition temperature of at least its surface fibres has
15 been reached.

8. The method of claim 7, **characterized** by bringing the web
to glass transition temperature by the aid of prewetting or
presteaming, or the conditions in the calender zone, such as
20 the temperature of the backing roll and prewetting.

9. An arrangement for calendering paper and board in the
manufacture of coated grades of paper or board, the
arrangement comprising

25 - at least one first calender for treating at least
one of the surfaces of an uncoated base material
web,

30 - means for treating at least the calendered surface
of the base web with at least one coating mix layer,
and

35 - at least one second calender for treating at least
the coated surface of the base web,

characterized in that

- the first calender is a shoe calender having a nip length of at least 50 mm, and

5

- the second calender is a calender having a nip length of 50 mm at the most.

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10. The arrangement of claim 9, **characterized** in that the first calender is a shoe calender having a nip length of 50 to 270 mm.

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11. The arrangement of claim 9, **characterized** in that the second calender is a belt calender where the nip is formed between two rolls.

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12. The arrangement of claim 9, **characterized** in that the second calender is a belt calender in which the nip is formed by means of a short shoe.

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13. The arrangement of any one of the previous claims 9 to 12, **characterized** in that the first calender is a shoe calender whose shoe is divided into sectors in the travelling direction of the web, the compression load of the sectors being independently controllable.

#3

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

Includes Reference to PCT International Applications

Attorney's Docket No.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method and arrangement for calendaring paper and board
before and after coating

the specification of which (check only one item below)

☐ is attached hereto☐ was filed as United States application

Serial No. _____

on _____

and was amended

on _____ (if applicable).

☒ was filed as PCT international applicationNumber PCT/FI99/00563on June 24, 1999

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of the application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

PRIOR FOREIGN/PCT APPLICATIONS AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

Country (if PCT, indicate "PCT")	Application Number	Date of Filing (day, month, year)	Priority Claimed Under 35 U.S.C. 119	
Finland	981467	25 June 1998	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PCT	PCT/FI99/00563	24 June 1999	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO

**COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Continued)**

Attorney's Docket No

Includes Reference to PCT International Applications

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		
PCT/FI99/00563	24 June 1999			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (*List name and registration number*)

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Combined Declaration for Patent Application and Power of Attorney (Continued) (Includes Reference to PCT International Applications)				Attorney's Docket No.
203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
204	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
205	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
206	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
207	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
208	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
209	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

Combined Declaration for Patent Application and Power of Attorney (Continued) (Includes Reference to PCT International Applications)				Attorney's Docket No.
2 1 0	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
2 1 1	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
2 1 2	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.</p>				
SIGNATURE OF INVENTOR 201		SIGNATURE OF INVENTOR 202		SIGNATURE OF INVENTOR 203
DATE December 1, 2000		DATE December 1, 2000		DATE
SIGNATURE OF INVENTOR 204		SIGNATURE OF INVENTOR 205		SIGNATURE OF INVENTOR 206
DATE		DATE		DATE
SIGNATURE OF INVENTOR 207		SIGNATURE OF INVENTOR 208		SIGNATURE OF INVENTOR 209
DATE		DATE		DATE
SIGNATURE OF INVENTOR 210		SIGNATURE OF INVENTOR 211		SIGNATURE OF INVENTOR 212
DATE		DATE		DATE